

## CLAIMS

1. A data transfer apparatus, comprising:

- 5           a first processor;
- a second processor in communication with said first processor via a data exchange path;
- each processor comprising a corresponding plurality of buffers;
- each processor comprising a set of four counters that are organized as
- 10   two pairs, where one pair of counters is used by a transmit channel via a data exchange path and a second pair of counters is used by a receive channel via a data exchange path;
- wherein said processors reserve remote buffers to coordinate the exchange of data packets by writing to said counters remotely and reading
- 15   from said counters locally;
- wherein said processors exchange said data packets with posting operations and without resort to remote read operations.

2. The apparatus of Claim 1, said counters comprising for each processor,

- 20   one each of:
- a remote buffers available counter;
- a local packets sent counter;
- a remote packets received counter; and
- a local buffers available counter.

25   3. The apparatus of Claim 2, wherein:

said remote buffers available counter is configured for local processor write only operation and remote processor read only operation;

said local packets sent counter is configured for local processor read and write operation;

5        said remote packets received counter is configured for local processor write only operation and remote processor read only operation; and

said local buffers available counter is configured for local processor read and write operation.

10        4. The apparatus of Claim 1, wherein said counters are non-wrapping.

5. A method for transferring data, comprising the steps of:

allocating a number of receive buffers locally with a first processor;

transferring addresses of said allocated buffers to a second processor;

15        said first processor incrementing a local buffers available counter by a number corresponding to the number of local buffers allocated;

said first processor writing said updated value to a remote buffers available counter in said second processor;

20        said second processor transferring data packets to buffers associated with said first processor;

said second processor incrementing a local packets sent counter after each packet is sent to said first processor until a value in said remote buffers available counter minus a value in said local packets sent counter is equal to zero or until all packets have been sent, which ever occurs first;

25        writing a current value of said local packets sent counter on said second processor to a remote packets sent counter on said first processor;

said first processor determining a number of completed transfers by subtracting a value in said remote packets sent counter from a value in said local buffers available counter; and

processing said buffers accordingly.

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6. A method for transferring data, comprising the steps of:

a first processor allocating buffer space when a second processor wants to send data to said first processor;

said first processor querying a local buffers available counter to  
10 determine if there is room for information on said first processor;

said first processor writing a value from said local buffers available counter to a remote buffers available counter in said second processor;

said second processor transferring data packets to said first processor;

said second processor incrementing a local packets transferred  
15 counter for each packet that is transferred; and

said second processor writing a value to a remote packets transferred counter of said first processor from said local packets transferred counter;

wherein said first processor knows how many packets it received and  
20 can read them locally.

7. The method of Claim 6, said first processor sending a remote buffers available value from said local buffers available counter to said second processor once said first processor has read said packets locally.

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8. The method of Claim 7, wherein said buffers reside in a single, memory, that is partitioned such that each processor has its own memory space.

9. A method for transferring data among two or more processors via a data exchange path, comprising the steps of:

a first processor writing a local buffers available value from a local buffers available counter to a remote buffers available counter in a second processor via said data exchange path;

said second processor transmitting data packets to said first processor;

said second processor incrementing a local packets transferred counter for each packet that is transmitted; and

said second processor writing a value to a remote packets transferred counter of said first processor from said local packets transferred counter;

wherein said first processor knows how many packets it received and can read them locally.

10. A data transfer method, comprising the steps of:

providing a first processor;

providing a second processor in communication with said first processor via a data exchange path;

each processor comprising a corresponding plurality of buffers;

each processor comprising a set of four counters that are organized as two pairs, where one pair of counters is used by a transmit channel via a data exchange path and a second pair of counters is used by a receive channel via a data exchange path;

wherein said processors reserve remote buffers to coordinate the exchange of data packets by writing to said counters remotely and reading from said counters locally;

wherein said processors exchange said data packets with posting operations and without resort to remote read operations.

11. The method of Claim 10, said counters comprising for each processor, one each of:

- a remote buffers available counter;
- a local packets sent counter;
- a remote packets received counter; and
- a local buffers available counter.

12. The method of Claim 11, wherein:

said remote buffers available counter is configured for local processor write only operation and remote processor read only operation;

said local packets sent counter is configured for local processor read and write operation;

said remote packets received counter is configured for local processor write only operation and remote processor read only operation; and

said local buffers available counter is configured for local processor read and write operation.

13. An apparatus for transferring data, comprising:

- a first processor for allocating a number of receive buffers locally;

said first processor comprising a mechanism for transferring addresses of said allocated buffers to a second processor;

said first processor comprising a mechanism for incrementing a local buffers available counter by a number corresponding to the number of local buffers allocated;

said first processor comprising a mechanism for writing said updated value to a remote buffers available counter in said second processor;

said second processor comprising a mechanism for transferring data packets to buffers associated with said first processor;

said second processor comprising a mechanism for incrementing a local packets sent counter after each packet is sent to said first processor until a value in said remote buffers available counter minus a value in said local packets sent counter is equal to zero or until all packets have been sent, which ever occurs first;

said second processor comprising a mechanism for writing a current value of said local packets sent counter on said second processor to a remote packets sent counter on said first processor;

said first processor comprising a mechanism for determining a number of completed transfers by subtracting a value in said remote packets sent counter from a value in said local buffers available counter; and

said first processor comprising a mechanism for processing said buffers accordingly.

14. An apparatus for transferring data, comprising:

a first processor for allocating buffer space when a second processor wants to send data to said first processor;

said first processor comprising a mechanism for querying a local buffers available counter to determine if there is room for information on said first processor;

5       said first processor comprising a mechanism for writing a value from said local buffers available counter to a remote buffers available counter in said second processor;

said second processor comprising a mechanism for transferring data packets to said first processor;

10       said second processor comprising a mechanism for incrementing a local packets transferred counter for each packet that is transferred; and

said second processor comprising a mechanism for writing a value to a remote packets transferred counter of said first processor from said local packets transferred counter;

15       wherein said first processor knows how many packets it received and can read them locally.

15. The apparatus of Claim 14, said first processor comprising a mechanism for sending a remote buffers available value from said local buffers available counter to said second processor once said first processor has read said packets locally.

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16. The apparatus of Claim 14, wherein said buffers reside in a single, memory, that is partitioned such that each processor has its own memory space.

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17. An apparatus for transferring data among two or more processors via a data exchange path, comprising:

a first processor for writing a local buffers available value from a local buffers available counter to a remote buffers available counter in a second processor via said data exchange path;

said second processor comprising a mechanism for transmitting data packets to said first processor;

said second processor comprising a mechanism for incrementing a local packets transferred counter for each packet that is transmitted; and

said second processor comprising a mechanism for writing a value to a remote packets transferred counter of said first processor from said local packets transferred counter;

wherein said first processor knows how many packets it received and can read them locally.

18. A data transfer method for a system that comprises a first processor and a second processor in communication with said first processor via a data exchange path, wherein each processor comprises a corresponding plurality of buffers, the method comprising the steps of:

providing each processor with a set of counters that are organized as pairs, where one pair of counters is used by a transmit channel via said data exchange path and a second pair of counters is used by a receive channel via said data exchange path;

said processors reserving remote buffers to coordinate the exchange of data packets by writing to said counters remotely and reading from said counters locally; and



said processors exchanging said data packets with posting operations and without resort to remote read operations.

19. A data transfer apparatus for a system that comprises a first processor and at least a second processor in communication with said first processor via a data exchange path, wherein each processor comprises a corresponding plurality of buffers, each said processor comprising:

- a remote buffers available counter;
- a local packets sent counter;
- a remote packets received counter; and
- a local buffers available counter.

20. The apparatus of Claim 19, wherein:

- said remote buffers available counter is configured for local processor write only operation and remote processor read only operation;
- said local packets sent counter is configured for local processor read and write operation;
- said remote packets received counter is configured for local processor write only operation and remote processor read only operation; and
- said local buffers available counter is configured for local processor read and write operation.